



Project Title: “Constructed Wetlands in Support of Riparian Restoration: Water Quality Benefits and Habitat Restoration”

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Introduction to the problem: Point and non-point source pollution is adversely affecting water quality in receiving water bodies (i.e. streams rivers, ponds lakes reservoirs, estuaries)(Top). “Green” technologies such as Constructed Wetlands are being proposed and utilized in place of more traditional options such as waste water treatment facilities or underground storage tank facilities (Bottom). Constructed Wetlands are effectively being used in a dual role of point and non-point source pollution control and mitigation of lost wetlands habitat for encouraging wildlife (i.e. waterfowl, shorebirds, mammals, etc) usage. Primarily focused on reductions of nutrients and suspended solids, Constructed Wetlands additionally receive inputs of other types of potentially persistent pollutants (i.e. PAH's, PCB's, pesticides, herbicides, metals, pharmaceuticals, etc). Unanswered concern is what is happening to these persistent pollutants that enter these wetland systems. Are they being processed, transformed, sequestered, bioaccumulated. Will these “green” technology solutions today become tomorrow's new “Superfund” sites.

Background: Wetlands constructed for use with three types (i.e. municipal effluent, Agricultural/CAFO effluent, Industrial effluent) of source pollution were evaluated. These systems were chosen to allow evaluation of three main environmental stressors common across many ecosystems. Additionally by choosing these point source focused systems we hope to evaluate the long term effect potential of these stressors by “shortening” the lag time in a relative basis by evaluating systems that receive higher concentrations of inputs than would be expected in more non-point source situations. Through this assessment the basis for a true cost-benefit analysis will be established.

Objectives: 1) Investigate the fate and effect of non-target stressors (contaminants) in municipal wastewater effluents, animal feedlot agricultural runoff, and industrial waste water effluent entering cells of constructed wetlands, 2) Develop an understanding of the interaction between ground water and surface water in the selected constructed wetlands, 3) Assess the long term potential for using Constructed Wetlands to attenuate non-point source pollution, in support of Riparian Restoration, 4) Evaluate Cost Benefit of using “Green” Technology (Constructed Wetlands) vs. Traditional Technologies (Underground Storage Tanks).

Approach: Three Constructed Wetlands receiving effluent from 1) a large (>80,000) municipality, 2) an animal (3000 feeder pigs) feedlot operation, and an industrial (oil production facility) were selected as study sites. This study was conducted in an integrated fashion, loosely following the Sediment Quality Triad Approach (Chapman 1989). The Sediment Quality Triad (TRIAD) approach is a weight of evidence approach that typically incorporates data from measures of sediment chemistry, laboratory toxicity, assessments of resident biota. Sampling stations were located in these wetlands from the top of the wetland where the effluent enters the wetland, to the bottom of the wetland where the water leaves the wetland. The following assessments were conducted : sediment chemical analysis, surface water chemical analysis, sediment toxicity assessment, limnological assessment, benthic invertebrate assessment, aquatic plant assessment, and ground water assessment. Lab and field-based research will be conducted collaboratively among scientists from EPA-ORD (GWERD, Ada OK) and the USGS (CERC, Columbia MO).

Accomplishments to date (26 Feb 2003): Sampling of all Wetlands sites is completed. Samples are currently being analyzed and data is being entered into the Project data base as it becomes available. Preliminary analysis on early data is being conducted. Early patterns of data response are being evaluated and reassessed as additional data becomes available.

Near future tasks: Near-term activities will include the completion of sample processing and data analysis, and the completion of a final report that has been identified as an FY04 APM under Goal 8.1. Concurrent activities will include initiating discussions with NRMRL economists to develop a roadmap for the monetizing of ecosystem benefits of Constructed Wetlands management options.

